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THE SIZE OF THE FIRM, EFFICIENCY AND GROWTH : THE RECENT INDIAN EXPERIENCE

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THE SIZE OF THE FIRM, EFFICIENCY AND GROWTH:

THE RECENT INDIAN EXPERIENCE

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1. In the developed countries the size distributions of firms in different industries came to be what they are largely due to technological developments and the degree of competition in different industries in successive phases of growth. Governments did not pursue any deliberate, positive policies for fostering the growth of small units until recently.

2. By contrast, in the poor countries now trying to develop, a 'firm-size policy' to protect and foster the growth of small enterprises has been made an integral part of growth policy from the very beginning of the process of planned growth. This policy involves the grant of subsidies for firms of the favoured size groups and/or taxes and restrictions on firms of other sizes.

3. Policies of this kind are based only partly on economic arguments. The main arguments for them are very often sociological. But it is necessary that the strictly economic size-efficiency relationships are clearly analysed.

4. Two main approaches to a study of size-efficiency relationships are: (a) statistical cost analysis and (b) size distribution analysis.

5. In the theory of production the optimum firm is defined as the firm whose short-run average cost curve is tangential to the envelope curve at its lowest point. Therefore, in statistical cost analysis an attempt is made to estimate empirical cost functions from cross-section data and identify the minimum cost scales of output. The results of such analyses conducted so far, and the problems thrown up by them have been discussed in two recent studies.[1]

6. Statistical cost functions for Indian industries cannot be estimated in the present state of the availability of data. Therefore, an attempt is made in this paper to analyse the current size trends in India with the available size distribution data.

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[1] National Bureau of Economic Research, Business Concentration and Price Policy, New York (1955); and J. Johnston, Statistical Cost Analysis, New York (1960).

7. The case for size distribution analysis rests, negatively, on the theoretical and practical difficulties involved in statistical cost analysis and, positively, on the so called 'survival principle', namely, that the plant sizes which remain dominant in fairly competitive industries over considerable periods of time are likely to be optimal or minimum average cost sizes.[2] The variations over time in the relative shares of different plant size classes in the output of different industries can, therefore, provide a good indication of the optimal size ranges in those industries.

8. Size distribution analysis has been applied recently by George Stigler to some American industries.[2] It has also been the chief method used by Professor P.S. Florence in analysing the structure of British and American industries.[3] The recently collected annual Census of Manufactures data now enables us to analyse changes in the size structure of 29 Indian industries as well.

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9. The first Indian Census furnishing figures by employment size classes was the 1953 Census. The last Census of which figures are available at the time of writing is the 1958 Census. In Table 1 the proportions of value added in 'small', 'medium' and 'large' units in 1953 and 1958 have been computed and compared for all the 29 Census industries. Units with less than 100 workers have been defined as 'small' units, units with 100 or more but less than 1,000 workers as 'medium' units and units with 1,000 or more workers as 'large' units.

10. The percentage distribution of value added is obviously a more important indicator of the relative importance of different classes than the percentage distribution of the number of units. For a large majority of the units in an industry may cluster in the 'small' size classes and yet their share in the total net output of the industry may be very small in comparison with that of the few large units. Our data provides a good illustration of this asymmetry. In 17 out of the 29 industries, half or more of the units were 'small' but in only three of them they turned out half or more of the total output. We shall, therefore, concentrate our attention on the relative share of output rather than the relative proportion of units in the 'small', 'medium' and 'large' sectors of every industry. The Table reveals several important characteristics of the size structure of the Census industries.

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[2] George J. Stigler, "The Economies of Scale", Journal of Law and Economics (October 1958).

[3] P.S. Florence, Post War Investment, Location and Size of Plant, Cambridge (1962).

TABLE 1

PERCENTAGE OF VALUE ADDED IN SMALL, MEDIUM AND LARGE UNITS

Industry	Small Units			Medium Units			Large Units		
	1958	1953	Increase or Decrease	1958	1953	Increase or Decrease	1958	1953	Increase or Decrease
Aluminium, Copper and Brass	12.4	19.8	- 7.4	54.2	56.4	- 2.2	33.4	23.8	+ 9.6
Iron and Steel	1.8	0.9	+ 0.9	5.5	2.8	+ 2.7	92.7	96.3	- 3.6
Bicycles	15.2	7.4	+ 7.8	31.8	46.4	- 14.6	53.0	46.2	+ 6.8
Sewing Machines	5.8	4.0	+ 1.8	3.9	3.9	0.0	90.3	92.1	- 1.8
Biscuit Making	30.0	26.8	+ 3.2	70.0	73.2	- 3.2	0.0	0.0	0.0
Fruit & Vegetable Processing	60.8	30.4	+ 30.4	39.2	69.6	- 30.4	0.0	0.0	0.0
Cement	0.0	0.0	0.0	45.0	50.7	- 5.7	55.9	49.3	+ 6.6
Glass and Glassware	2.0	2.6	- 0.6	86.2	89.5	- 3.3	11.8	8.7	+ 3.1
Ceramics	3.1	3.5	- 0.4	50.8	51.8	- 1.0	46.1	44.8	+ 1.3
Plywood and Tea-Chests	15.5	20.1	- 4.6	84.6	80.7	+ 3.9	0.0	0.0	0.0
Cotton Textiles	0.4	0.3	+ 0.1	9.2	5.9	+ 3.3	90.4	93.8	- 3.4
Woollen Textiles	3.2	3.2	0.0	35.1	27.8	+ 7.3	61.7	69.0	- 7.3
Edible Hydrogenated Oils	0.0	0.8	- 0.8	100.0	68.0	+ 32.0	0.0	31.2	- 31.2[a]
Paints and Varnishes	14.2	12.9	+ 1.2	85.9	87.1	- 1.3	0.0	0.0	0.0
Electric Lamps	3.8	3.7	+ 0.1	96.2	96.3	- 0.1	0.0	0.0	0.0
Electric Fans	7.0	5.3	+ 1.7	77.1	46.9	+ 30.2	15.9	47.8	- 31.9[a]
Engineering	19.2	25.7	- 6.5	46.3	41.1	+ 5.2	34.5	33.2	+ 1.3
Jute Textiles	0.0	0.0	0.0	0.8	0.7	+ 0.1	99.2	99.3	- 0.1
Chemicals	13.7	16.1	- 2.4	51.1	53.5	- 2.4	35.2	30.4	+ 4.8
Paper and Paperboard	1.0	1.0	0.0	15.0	17.1	- 2.1	84.0	81.9	+ 2.1
Matches	0.6	0.2	+ 0.4	16.5	5.9	+ 10.6	82.9	94.0	- 11.1
Soap	1.6	5.5	- 3.9	23.2	20.0	+ 3.2	75.2	74.6	+ 0.6
Tanning	32.3	37.0	- 4.7	68.0	63.0	+ 5.0	0.0	0.0	0.0
Starch	2.3	5.4	- 3.1	97.7	96.4	+ 1.3	0.0	0.0	0.0
Vegetable Oils	69.9	62.5	+ 7.4	30.1	37.5	- 7.4	0.0	0.0	0.0
Sugar	0.2	0.0	+ 0.2	60.9	47.9	+ 13.0	39.1	52.2	- 13.1
Distilleries and Breweries	17.8	23.3	- 5.5	82.2	76.9	+ 5.3	0.0	0.0	0.0
Wheat Flour	32.4	14.4	+ 18.0	67.8	85.6	- 17.8	0.0	0.0	0.0
Rice Milling	94.1	97.7	- 3.6	5.9	2.3	+ 3.6	0.0	0.0	0.0

Source: Computed from data in the Census of Manufacturing Industries, 1953 and 1958.

[a] The decline in the share of large units in these industries is due to some large units failing to file returns in 1958 and is, therefore, spurious.

11. There are only three industries in which more than half of the total value added is accounted for by 'small' units: rice milling, vegetable oil processing and fruit and vegetable processing - all food processing industries. In 10 out of the 29 industries more than half of the output is produced in 'large' units; and in 15 industries more than half of the output is produced in 'medium' units. In one industry - general and electrical engineering - about a third of the net output is produced in 'large' units, a little less than half in 'medium' units and about a sixth in 'small' units.

12. Thus we may characterize 10 out of the 29 industries as 'large-scale' industries, 16 as 'medium-scale' industries (including engineering) and only 3 as 'small-scale' industries.

13. It is noteworthy that the large-scale industries include many in which intensive efforts have been made to promote small unit production, for example, soap, paper, matches, cotton textiles, woollen textiles, bicycles and sewing machines. The development of the first five of these is the responsibility of the Khadi and Village Industries Commission and the development of the last two is looked after by the Small Scale Industries Board. But small units did not account for more than 6% of the net output in any of these industries except bicycles.

14. In some of the medium-scale industries, again - glassware, ceramics, hydrogenated oil, electric lamps and electric fans, starch and sugar - small units have a negligible share. In others - copper and brass, plywood, paints and varnishes, chemicals, distilleries and breweries - they have a small but significant share of 10 to 15%. In only three industries - biscuit making, tanning and wheat flour - they share about a third of the net output.

15. When we consider the changes between 1953 and 1958, we find that the relative importance of small, medium and large units did not alter materially. The small units increased their share significantly only in fruit and vegetable processing, vegetable oil extraction, flour making and bicycle making. In oil extraction the small units were already dominant. In the other three, they did snatch a sizeable share of output from the medium units. In the bicycle industry, large units as well as small units gained at the expense of medium units and the large units came to produce more than half of the output inspite of the expansion in small unit capacity fostered by the government.

16. The medium unit sector increased its share substantially in the hydrogenated oil, electric fans, match and sugar industries entirely at the expense of large units.

17. The large units made gains in non-ferrous metals, cement, paper and chemical industries while maintaining their dominant position in eight other industries.

18. The changes in the size structure of industries can also be analysed in another way. We can compute the weighted average size of the units in an industry in terms of the number of persons employed and compare them as between different industries on the same date and at different dates in the same industry. The 'weighted average size' may be defined as $\sum w_i s_i$, where s_i are the mid-points of the size intervals in terms of employment and w_i the proportions of value added in the various size classes.

19. Table 2 shows the weighted average size of the units in each of the 29 Census industries in 1953 and 1958. If we stick to our definition of large-scale, medium-scale and small-scale industries, it appears that, considering the size of the 'representative unit', 12 industries were large-scale industries, 16 industries were medium-scale industries and only one industry - rice milling - a small-scale industry in 1953. In 1958, two industries - non-ferrous metals and engineering - graduated from the medium-scale to the large-scale class. Other industries remained in the same class as before. But the average size increased in 19 industries and decreased in 10. Neglecting changes of less than 10% in the average size, we find that the average size decreased only in 5 industries, viz., fruit and vegetable processing, hydrogenated oil, matches, tanning and wheat flour. In 12 other industries, the average size increased by more than 10%.

20. From these findings we may conclude that:

(a) So far as the 29 Census industries are concerned medium and large units account for a major part of output except in 3 food processing industries. The share of the small units does not exceed 15% in any non-food-processing industry with the exception of tanning.

(b) During the 5 years of planned growth 1953-1958, cycle-making is the only non-food industry in which small units increased their share of the output significantly, but it still remained less than a sixth. On the whole, the relative share of production in large and medium units increased more than that of small units.

(c) The average unit size increased in 19 and decreased in 10 industries. But the industries in which the decrease was significant were, again, food processing, tanning and match-making.

21. It seems, therefore, that industrial growth in India is, by and large, following the historically familiar pattern[4] of the increasing dominance of large-unit production in a wide range of industries. Government effort to encourage small unit production does not seem to have succeeded in significantly altering this trend.

4 Statistical documentation of this trend in British and U.S. industry may be found in Florence, op. cit. and S.S. Sands, "Concentration in United States Manufacturing Industry, 1904-1947", International Economic Review, (January 1962). In Japan, as is well known, the trend has been somewhat different for special historical reasons.

TABLE 2

CHANGES IN THE WEIGHTED AVERAGE FIRM SIZE IN INDIAN INDUSTRIES 1953-58

Industry	Weighted Average Size (Number of Persons Employed) 1953	1958	Increase or Decrease Absolute	%
Aluminium, Copper and Brass	778	1,003	+ 225	+ 28.92
Iron & Steel	11,896	13,679	+ 1,783	+ 14.99
Bicycle	916	980	+ 64	+ 6.99
Sewing Machines	3,232	3,170	- 62	- 1.92
Biscuit Making	323	672	+ 349	+ 15.17
Fruit & Vegetable Processing	143	110	- 33	- 23.08
Cement	1,101	1,466	+ 365	+ 33.15
Glass & Glassware	478	651	+ 173	+ 36.19
Ceramics	1,572	1,570	- 2	- 0.13
Plywood & Tea-Chests	301	372	+ 71	+ 23.59
Cotton Textiles	3,366	3,725	+ 359	+ 10.66
Woollen Textiles	1,969	2,111	+ 142	+ 7.21
Edible Hydrogenated Oils	783	522	- 261	- 33.33
Paints & Varnishes	466	449	- 17	- 3.57
Electric Lamps	476	535	+ 59	+ 12.40
Electric Fans	612	695	+ 83	+ 13.56
Engineering	952	1,302	+ 350	+ 36.76
Jute Textiles	3,455	3,653	+ 198	+ 5.73
Chemicals	1,431	1,496	+ 65	+ 4.54
Paper & Paperboard	2,552	2,427	- 125	- 4.90
Matches	2,686	1,295	- 1,391	- 51.79
Soap	1,249	1,270	+ 21	+ 1.68
Tanning	265	234	- 31	- 11.70
Starch	365	440	+ 75	+ 20.55
Vegetable Oils	140	153	+ 13	+ 9.29
Sugar	1,187	1,109	- 78	- 6.57
Distilleries & Breweries	180	231	+ 51	+ 28.33
Wheat Flour	357	214	- 143	- 40.06
Rice Milling	56	58	+ 2	+ 3.57

Source: Computed from data in the Census of Manufacturing Industries, 1953 and 1958.

22. The explanation for this fact is not merely that the scale of the effort has been inadequate. It lies, above all, in the failure to widen the effective choice of techniques. So long as the imported techniques available for most of the consumer goods industries are economically viable only when production is organised on a large scale the scope for expanding the small-scale sector must remain severely limited. The small-scale sector will then remain confined to industries which are auxiliary to large-scale industries or only require design development or organisational improvement. But if it is to extend beyond these, nothing less than the discovery of a whole range of new techniques which can enable small units to produce almost as cheaply as large units will have to be discovered and adapted to the milieu of the newly developing countries. The future of small industry is bound up with the prospect of discovering such techniques. The scientific method is, in principle, neutral to the scale of operation. "There is nothing in the results of disinterested scientific research which makes it inevitable that they should be applied for the benefit of centralized finance, industry and government. If inventors and technicians so chose, they could just as well apply the results of pure science for the purpose of increasing the economic self-sufficiency and consequently the political independence of small owners, working either on their own or in cooperative groups."[5]

23. But inventors and technicians cannot choose to do so of their own accord. They would have to be persuaded, commissioned and paid to do so in pursuit of a bold new policy of developing new techniques. If governments, international organisations and scientists wish to translate the sociological advantages of small-unit operation into a reality they must devote more attention and resources to research oriented to the discovery and application of such techniques.

5 Aldous Huxley, Science, Liberty and Peace, 13-14.